

### **REMARKS**

In view of the foregoing amendments and the following remarks, Applicants respectfully request reexamination of the present application. Claims 20, 22, 24 and 26 have been amended, Claims 1-19 and 35-41 have been cancelled without prejudice or disclaimer of the subject matter contained therein, and new Claims 42 and 43 have been added. Claims 20-34, 42 and 43 remain pending.

The Examiner has maintained the restriction requirement with respect to the claims of the present application. Therefore, Applicants have cancelled Claims 35-41 and reserve the right to pursue these claims in one or more subsequently filed divisional applications.

The Examiner has rejected Claims 8 and 26 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that Claims 8 and 26 require a permeability of at least about 50, however, there are no units required and thus, the metes and bounds of this claim are not clearly defined.

Claim 8 has been cancelled. Claim 26 has been amended to clarify that the magnetic permeability is the relative magnetic permeability. The relative magnetic permeability is the magnetic permeability of a material relative to the magnetic permeability of a vacuum. Therefore, this is a unitless quantity. Further, it is respectfully submitted that one of ordinary skill in the art would immediately recognize that the permeability values disclosed by Applicants with respect to the magnetic layers of the present invention are the relative permeability values, as opposed to the absolute permeability. In view of the foregoing, Applicants request removal of this rejection under 35 U.S.C. § 112 with respect to Claim 26.

The Examiner has rejected Claims 20-34 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,818,330 by Shukh et al.

The Examiner states that Shukh et al. disclose a magnetic recording medium having a substrate, an underlayer structure formed from alternating soft magnetic layers separated by non-magnetic spacer layers such as Ru, wherein the soft magnetic layers are anti-ferromagnetically coupled across the spacer layers, and further including a perpendicular recording layer formed on the underlayer structure via an intermediate layer. (Referring to

Col. 4, lines 39-62; Col. 5, lines 6-18; Col. 6, lines 1-11 and 45-52.)

Independent Claim 20 recites an underlayer structure comprising first, second and third soft magnetic layers, where each of the three soft magnetic layers is separated by a non-magnetic spacer layer, and wherein the second and third soft magnetic underlayers are anti-parallel coupled. Applicants have amended Claim 20 to recite that the thickness of the first soft magnetic layer (i.e., closest to the substrate) is thicker than either of the second or third soft magnetic layers. New dependent Claim 42 has also been added, which recites that the thickness of the first soft magnetic layer is thicker than the total sum of the second and third soft magnetic layers. Claim 43 has also been added which recites specific preferred thickness values for the soft underlayers. Support for these amendments can be found, *inter alia*, at page 16, lines 8-22 of the present specification.

Shukh et al. discloses a soft magnetic underlayer structure having alternating soft magnetic layers and non-magnetic spacer layers, separated by magnetic interface layers. See, for example, Fig. 4 of Shukh et al. However, Shukh et al. does not disclose an embodiment where the thickness of the magnetically soft underlayer closest to the substrate is greater than the thickness of anti-parallel coupled magnetically soft underlayers that are disposed over the thicker magnetically soft layer and closer to the magnetic recording layer.

As is disclosed in the present application, the thicker first soft underlayer enhances the flux return path that is provided by the underlayer structure, while the anti-parallel coupled structure of the thinner second and third soft magnetic underlayers decreases noise and decreases the  $PW_{50}$  (pulse width) for perpendicular magnetic recording.

In view of the foregoing, removal of this rejection over Shukh et al. is requested.

The Examiner has rejected Claims 1, 3-16 and 20-34 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,686,070 by Futamoto et al.

The Examiner states that Futamoto et al. discloses a magnetic recording medium having a substrate, an underlayer structure formed from alternating soft magnetic layers separated by non-magnetic spacer layers such as Ru, wherein the soft magnetic layers are anti-ferromagnetically coupled across the spacer layers, and further including a

perpendicular recording layer formed on the underlayer structure via an intermediate layer. The Examiner also states that the reference teaches examples wherein the first soft magnetic layer (corresponding to the first soft magnetic layer in Claim 1) has a thickness of 150 nm and the second soft magnetic layer has a thickness of 40 nm. (See, Fig. 1, 3, 6, 7; Col. 5, lines 8-52; Col. 10, line 47 to Col. 11, line 3; Table 2, Col. 11-12.)

Applicants note that Claims 1 and 3-16 have been cancelled. As is discussed above, Applicants have amended Claim 20 to recite that the thickness of the first soft magnetic layer (closest to the substrate) is thicker than either of the second or third soft magnetic layers. Futamoto et al. does not disclose the structure recited in independent Claim 20. Fig. 6 of Futamoto et al. discloses an underlayer structure wherein a soft magnetic underlayer closest to the substrate is thicker than the soft magnetic underlayer closer to the magnetic recording layer. However, the soft magnetic underlayer closest to the magnetic recording layer is a *single* soft underlayer, and is not a structure wherein two magnetically soft underlayers are anti-parallel coupled through a non-magnetic layer *and* a thicker magnetically soft underlayer is disposed beneath the two anti-parallel coupled underlayers, separated by an additional non-magnetic layer. Therefore, removal of this rejection over Futamoto et al. is requested.

The Examiner has rejected Claims 2, 17-19 and 21 under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al., in view of Shukh et al.

The Examiner states that Futamoto et al. teaches all of the limitation of the claims except for the use of NiP/Al substrate and the use of an exchange enhancement layer between the non-magnetic spacer layer and the second soft magnetic layer.

The Examiner states that Shukh et al. teaches the equivalence of various materials such as NiP/Al and glass for use as a substrate in a magnetic recording structure (Col. 4, lines 42-46). The Examiner concludes that it would have been obvious to substitute NiP/Al for the glass substrate taught by Futamoto et al. in view of the art recognized equivalence of the two materials as taught by Shukh et al. The Examiner also states that Shukh et al. also teaches that it is known to add exchange enhancement layers in between soft magnetic layers and non-magnetic spacer layers in an anti-ferromagnetically coupled underlayer structure in order to increase the exchange coupling effect between adjacently

coupled soft magnetic layers (Col. 2, line 55 to Col. 3, line 5). The Examiner concludes that it would have been obvious to add exchange coupling layers as suggested by Shukh et al. to the structure taught by Futamoto et al. in order to increase the observed exchange coupling effect.

Claims 2 and 17-19 have been cancelled. Claim 21 depends upon Claim 20, which is discussed above and has been distinguished over Shukh et al. and Futamoto et al. Therefore, removal of this rejection is also requested.

Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecute and or expedite allowance, the Examiner is invited to contact the undersigned.

It is not believed that any fees are owed with respect to this response; however, any such fees can be charged to Deposit Account No. 50-1419.

Respectfully submitted,

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